From:	Thomas Fox
To:	Spellman, John (DEC)
Cc:	Christopher Wagner
Subject:	Clarkstown Landfill Groundwater/Surface Water Report for 2022
Date:	Tuesday, January 17, 2023 2:53:13 PM
Attachments:	Clarkstown Annual GW SW Report for 2022.pdf

Good afternoon, John,
Please find attached our 2022 annual groundwater and surface water report for the Clarkstown Landfill. I apologize for the delay in getting this to you, but we had some changes in staff and some people on leave. That's all behind us now though.

Note I have not included the actual laboratory report since it's a 33 meg file. If needed, I can send the complete report via a download link.

Thanks, and feel free to call me if you would like to discuss.

Thanks

Tom Fox

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January 17, 2023

John Spellman, Project Manager
Division of Environmental Remediation
NYS Department of Environmental Conservation, Region 03
625 Broadway
Albany, NY 12233-7014

Re: Town of Clarkstown Landfill
Annual Groundwater/Surface Water/Quarterly Landfill Gas Monitoring Program
Third Quarter 2022
D&B No. 3792

Dear Mr. Spellman:

As the engineering consultant for the Town of Clarkstown, this correspondence serves as the annual report for the groundwater sampling program, surface water sampling program and quarterly report for the landfill gas monitoring program conducted during the third quarter of 2022 for the Town of Clarkstown landfill located on Route 303 in West Nyack, NY.

The monitoring program was conducted between September 25 and October 5, 2022 and included landfill gas and vector monitoring, settlement plates/railroad spikes surveying and groundwater and surface water sampling. Samples were analyzed by Pace Analytical (Pace) located in Melville, NY, a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified laboratory. Work was conducted in accordance with the approved Environmental and Facility Monitoring Plan dated January 4, 2001, and as modified on July 13, 2005. A site plan entitled **Figure 1** is enclosed with this providing all sampling/monitoring locations.

Landfill Gas Monitoring

Landfill gas monitoring consisted of surveying nine of ten existing gas monitoring wells (GM-1, GM-2, GM-3, GM-4, GM-5, GM-6, GM-8, GM-9 and GM-10). Note that gas monitoring Well GM-07 was damaged and could not be monitored.

Table 1 identifies the landfill gas monitoring wells and their corresponding concentrations of carbon monoxide, oxygen, lower explosive limit (LEL %) for methane, and hydrogen sulfide as monitored on September 25, 2022 using a GEM 5000 Plus landfill gas meter. Weather conditions that day were partly cloudy with a temperature of about 64 degrees Fahrenheit, low winds. As summarized in Table 1, methane, hydrogen sulfide, carbon monoxide and LEL were all found to be at concentrations below the instrument detection limits.

Vector Monitoring

The vegetated landfill cover system was inspected during the monitoring program. No potential vectors such as wildlife, rodents, scavenger birds, or other insects were observed.

Settlement Plates and Railroad Spike Survey

The settlement plates and railroad spike points were surveyed this monitoring period by New York State Licensed Surveyors Colliers Engineering & Design CT, P.C. (formerly Maser Consulting P.A.), subcontractor to D&B Engineers and Architects (D&B). Settlement plate and railroad spike elevation measurements are provided in **Appendix A**.

Groundwater Sampling

The groundwater samples were analyzed for the baseline suite of parameters based on New York State Department of Environmental Conservation (NYSDEC) Part 360 requirements as identified in 6 NYCRR Part 360-2.11 (d)(6). The analyses included leachate indicators, inorganic parameters and organic parameters associated with the baseline requirements. The laboratory test results were compared to the NYSDEC Class GA groundwater standards as identified in the Division of Water Technical and Operational Guidance Series (TOGS) (1.1.1) - Ambient Water Quality Standards and Guidance Values dated June 1998. The volatile organic compound (VOC) parameters, inorganic parameters and leachate indicators that were detected at concentrations exceeding the NYSDEC standards are indicated in the enclosed **Tables 2-1, 2-2 and 2-3**, respectively. Additionally, the Pace analytical data reports are provided in **Appendix B**.

Groundwater samples were collected from 11 groundwater monitoring wells (i.e., RFW-1S, RFW-lD, RFW-2, RFW-3S, RFW-3D, RFW-4D, RFW-5SR, RFW-6D, RFW-7S, RFW-8S and RFW-11) between September 29 and October 5, 2022. A Field blank sample (Field Blank) was collected through new tubing via peristaltic pump.

Surface Water and Leachate Sampling

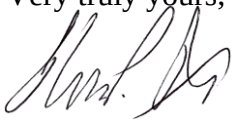
Surface Water samples were collected from 7 of the 7 locations (SW-1, SW-2, SW-3, SW-4, SW-5, SW-6 and SW-7) on October 5, 2022. The surface water samples were analyzed for the baseline suite of parameters based on NYSDEC Part 360 requirements as identified in 6 NYCRR Part 360-2.11 (d)(6). The analyses included leachate indicators, inorganic parameters and organic parameters associated with the baseline requirements. Consistent with historical Quarterly Monitoring Program reports, the laboratory test results were compared to the NYSDEC Class GA groundwater standards as identified in the Division of Water Technical and Operational Guidance Series (TOGS) (1.1.1) - Ambient Water Quality Standards and Guidance Values dated June 1998. The VOCs, inorganic parameters and leachate indicators that were detected at concentrations

exceeding the NYSDEC standards are indicated in the enclosed **Tables 3-1, 3-2 and 3-3**, respectively. Additionally, the Pace analytical data package is attached as **Appendix C**.

In addition, a sample was collected from the leachate storage tank discharge piping on October 5, 2022. The sample was analyzed for the routine suite of parameters based on NYSDEC Part 360 requirements as identified in 6 NYCRR Part 360-2.11 (d)(6). The analyses included leachate indicators, inorganic parameters and organic parameter. The laboratory test results were compared to the NYSDEC Class GA groundwater standards as identified in the Division of Water Technical and Operational Guidance Series (TOGS) (1.1.1) – Ambient Water Quality Standards and Guidance Values dated June 1998. The VOCs, inorganic parameters and leachate indicators that were detected in the one leachate sample exceeding the NYSDEC standards are indicated in the enclosed Tables 3-1, 3-2 and 3-3, respectively. Additionally, the Pace analytical data package is attached as Appendix C.

If you should have any questions, please contact me at (516) 364-9890, Ext. 3068.

Very truly yours,

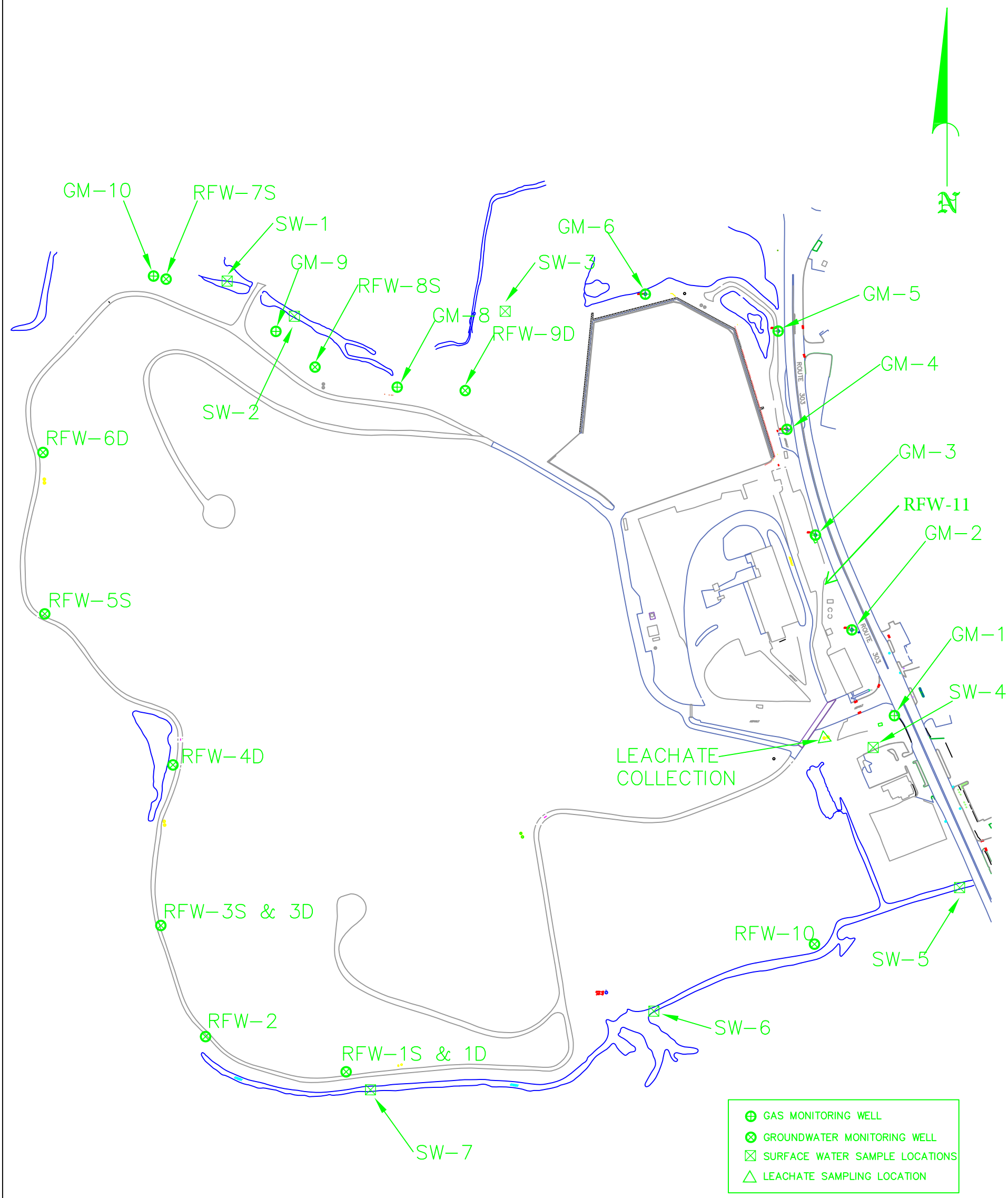


Thomas P. Fox, P.G.
Senior Associate

TPFt/cf
Enclosures
cc: C. Wagner (Clarkstown)
F. DeVita (D&B)
♦3792\TPF011723JS_Ltr

FIGURE 1

SAMPLE LOCATION MAP



MAP SOURCE: TOWN OF CLARKSTOWN

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CLARKSTOWN LANDFILL
ENVIRONMENTAL MONITORING

SAMPLE LOCATION MAP

NOT TO SCALE

FIGURE 1

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TABLES

Table 1
Town of Clarkstown Landfill
Landfill Monitoring Program
Landfill Gas Monitoring Results, Third Quarter 2022

Sampling Date: September 25, 2022

Parameter	Unit	Landfill Gas Monitoring Well									
		GM-1	GM-2	GM-3	GM-4	GM-5	GM-6	GM-7	GM-8	GM-9	GM-10
Methane	%	0	0	0	0	0	0	N/A	0	0	0
Lower Explosive Limit	%	0	0	0	0	0	0	N/A	0	0	0
Oxygen	%	20.1	19.2	19.1	20.2	18.7	18.6	N/A	19.4	19.6	19.9
Hydrogen Sulfide	ppm	0	0	0	0	0	0	N/A	0	0	0
Carbon Monoxide (CO)	ppm	0	0	0	0	0	0	N/A	0	0	0

Notes: GM-7 had no cap for sampling. Could not attach GEM5000 Plus Gas Analyzer
ppm= Part Per Million
%= Percent

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Table 2-1
Town of Clarkstown Landfill
Annual Groundwater Monitoring Program
Monitoring Well Sample Results
Volatile Organic Compounds

Units in ug/l	Sample ID / Sample_date	RFW-1S 10/05/22	MFW-1D 09/29/22	RFW-2 10/05/22	RFW-3S 09/30/22	RFW-3D 09/30/22	RFW-4D 10/03/22
COMPOUNDS	NYSDEC CLASS GA GROUNDWATER ST/GV						
1,1,1,2-Tetrachloroethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	1 ST	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichloropropane	0.04 ST	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromo-3-Chloropropane	0.04 ST	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane (Ethylene Dibromide)	0.0006 ST	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	3 ST++	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	0.6 ST	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	1 ST	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	3 ST++	1 U	1 U	1 U	1 U	1 U	1 U
2-Butanone (MEK)	50 GV	1.4 J	5 U	1.3 J	5 U	5 U	5 U
2-Hexanone	50 GV	5 U	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-Pentanone	--	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	50 GV	35.4	5 U	31.9	2.3 J	2.9 J	6.1
Acrylonitrile	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Benzene	1 ST	1 U	1 U	1 U	1 U	1 U	1 U
Bromochloromethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	50 GV	1 U	1 U	1 U	1 U	1 U	1 U
Bromoform	50 GV	1 U	1 U	1 U	1 U	1 U	1 U
Bromomethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Carbon Disulfide	60 GV	1 U	1 U	1 U	1 U	1 U	1 U
Carbon Tetrachloride	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Chloroethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	7 ST	1 U	1 U	1 U	1 U	1 U	1 U
Chloromethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Cis-1,2-Dichloroethylene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Cis-1,3-Dichloropropene	0.4 ST	1 U	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	50 GV	1 U	1 U	1 U	1 U	1 U	1 U
Dibromomethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Iodomethane (Methyl Iodide)	5 ST	4 U	4 U	4 U	4 U	4 U	4 U
m,p-Xylenes	5 ST+	3 U	3 U	3 U	3 U	3 U	3 U
Methylene Chloride	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
o-Xylene	5 ST+	3 U	3 U	3 U	3 U	3 U	3 U
Styrene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethylene(PCE)	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Trans-1,2-Dichloroethene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Trans-1,3-Dichloropropene	0.4 ST	1 U	1 U	1 U	1 U	1 U	1 U
Trans-1,4-Dichloro-2-Butene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethylene (TCE)	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Trichlorofluoromethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl Acetate	---	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl Chloride	2 ST	1 U	1 U	1 U	1 U	1 U	1 U
Total Volatile Organic Compounds	---	36.8	0	33.2	2.3	2.9	6.1

+	Applies to each isomer individually
++	Applies to sum of isomer
U	Compound was analyzed for but not detected
J	Estimated value

Exceeds Class GA Standard

ug/l	Micrograms per liter
GV	Guidance Value
ST	Standard
--	No ST or GV or analyzed

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Table 2-1
Town of Clarkstown Landfill
Annual Groundwater Monitoring Program
Monitoring Well Sample Results
Volatile Organic Compounds

Units in ug/l	Sample ID / Sample_date	RFW-5SR 09/30/22	RFW-6D 10/03/22	MFW-7S 10/05/22	MFW-8S 10/05/22	MFW-11 10/05/22
COMPOUNDS	NYSDEC CLASS GA GROUNDWATER ST/GV					
1,1,1,2-Tetrachloroethane	5 ST	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	5 ST	1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	5 ST	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	1 ST	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	5 ST	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	5 ST	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichloropropane	0.04 ST	1 U	1 U	1 U	1 U	1 U
1,2-Dibromo-3-Chloropropane	0.04 ST	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane (Ethylene Dibromide)	0.0006 ST	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	3 ST++	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	0.6 ST	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	1 ST	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	3 ST++	1 U	1 U	1 U	1 U	1 U
2-Butanone (MEK)	50 GV	5 U	5 U	1.7 J	5 U	5 U
2-Hexanone	50 GV	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-Pentanone	--	5 U	5 U	5 U	5 U	5 U
Acetone	50 GV	3.9 J	2.2 J	13.9	3.4 J	6.5
Acrylonitrile	5 ST	1 U	1 U	1 U	1 U	1 U
Benzene	1 ST	1 U	1 U	1 U	1 U	1 U
Bromochloromethane	5 ST	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	50 GV	1 U	1 U	1 U	1 U	1 U
Bromoform	50 GV	1 U	1 U	1 U	1 U	1 U
Bromomethane	5 ST	1 U	1 U	1 U	1 U	1 U
Carbon Disulfide	60 GV	1 U	1 U	1 U	1 U	1 U
Carbon Tetrachloride	5 ST	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	5 ST	1 U	1 U	1 U	1 U	1 U
Chloroethane	5 ST	1 U	1 U	1 U	1 U	1 U
Chloroform	7 ST	1 U	1 U	1 U	1 U	1 U
Chloromethane	5 ST	1.2	1.4	1 U	1.3	1 U
Cis-1,2-Dichloroethylene	5 ST	17.8	1 U	1 U	1 U	1 U
Cis-1,3-Dichloropropene	0.4 ST	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	50 GV	1 U	1 U	1 U	1 U	1 U
Dibromomethane	5 ST	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	5 ST	1 U	1 U	1 U	1 U	1 U
Iodomethane (Methyl Iodide)	5 ST	4 U	4 U	4 U	4 U	4 U
m,p-Xylenes	5 ST+	3 U	3 U	3 U	3 U	3 U
Methylene Chloride	5 ST	1 U	1 U	1 U	1 U	1 U
o-Xylene	5 ST+	3 U	3 U	3 U	3 U	3 U
Styrene	5 ST	1 U	1 U	1 U	1 U	1 U
Tetrachloroethylene(PCE)	5 ST	3.2	1 U	1 U	1 U	1 U
Toluene	5 ST	1 U	1 U	1 U	1 U	1 U
Trans-1,2-Dichloroethene	5 ST	1 U	1 U	1 U	1 U	1 U
Trans-1,3-Dichloropropene	0.4 ST	1 U	1 U	1 U	1 U	1 U
Trans-1,4-Dichloro-2-Butene	5 ST	1 U	1 U	1 U	1 U	1 U
Trichloroethylene (TCE)	5 ST	1450	1 U	1 U	1 U	1 U
Trichlorofluoromethane	5 ST	1 U	1 U	1 U	1 U	1 U
Vinyl Acetate	---	1 U	1 U	1 U	1 U	1 U
Vinyl Chloride	2 ST	1 U	1 U	1 U	1 U	1 U
Total Volatile Organic Compounds	---	1476.1	3.6	15.6	4.7	6.5

\+ Applies to each isomer individually
++ Applies to sum of isomer
U Compound was analyzed for but not detected
J Estimated value

Exceeds Class GA Standard
ug/l Micrograms per liter
GV Guidance Value
ST Standard
-- No ST or GV or analyzed

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Table 2-2
Town of Clarkstown Landfill
Annual Groundwater Monitoring Program
Monitoring Well Sample Results
Inorganic Parameters

Units in ug/l	Sample ID / Sample_date	RFW-1S 10/05/22	MFW-1D 09/29/22	RFW-2 10/05/22	RFW-3S 09/30/22	RFW-3D 09/30/22	RFW-4D 10/03/22	RFW-5SR 09/30/22	RFW-6D 10/03/22	MFW-7S 10/05/22	MFW-8S 10/05/22	MFW-11 10/05/22
METALS	NYSDEC CLASS GA GROUNDWATER ST/GV											
Aluminum	--	2130	200 U	62.2 J	33.6 J	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Antimony	3 ST	60 U	60 U	60 U	60 U	60 U	60 U	60 U	60 U	60 U	60 U	60 U
Arsenic	25 ST	10 U	9.2 J	10 U	10 U	5.4 J	10 U	6.9 J	10 U	7.4 J	10 U	10 U
Barium	1000 ST	43.4 J	264	14 J	338	109 J	315	670	378	1410	1390	1340
Beryllium	3 GV	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Boron	1000 ST	1160	92.3	42.5 J	31.4 J	22.5 J	38.8 J	44 J	121	114	106	109
Cadmium	5 ST	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Calcium	--	60000	93900	9830	43400	27000	87000	114000	35100	128000	126000	123000
Chromium, Hexavalent	50 ST	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Chromium, Total	50 ST	2.8 J	17.8	10 U	3 J	4.1 J	2.3 J	10 U	10 U	1.2 J	1.3 J	10 U
Cobalt	--	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Copper	200 ST	16.6 J	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Cyanide	200 ST	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Iron	300 ST	292	90.9 J	128	25.6 J	28.3 J	100 U	100 U	100 U	35600	34900	33900
Lead	25 ST	5.1	5 U	2.7 J	5 U	5 U	5 U	5 U	2.4 J	2.4 J	4.1 J	2.7 J
Magnesium	35000 GV	1800	10100	3020	5220	3140	10400	9970	11500	22000	21600	21200
Manganese	300 ST	67.9	10 U	45.3	10 U	10 U	3.4 J	39	42.4	3160	3150	3050
Mercury	0.7 ST	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.095 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	100 ST	40 U	17.7 J	40 U	11.8 J	10.2 J	39.3 J	18.2 J	14.8 J	46.7	45.1	44.4
Potassium	--	1700 J	4380 J	1830 J	1730 J	1420 J	1960 J	2010 J	2340 J	4730 J	4850 J	4580 J
Selenium	10 ST	10 U	10 U	10 U	10 U	100 U	10 U	10 U	10 U	10 U	10 U	10 U
Silver	50 ST	10 U	1.3 J	10 U	10 U	10 U	10 U	1.6 J	10 U	2 J	2 J	1.8 J
Sodium	20000 ST	29500	21000	37400	7880	5090	14000	9940	10100	18500	18100	17700
Thallium	0.5 GV	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vanadium	--	4.6 J	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Zinc	2000 GV	30.3	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U

ug/l	Micrograms per liter
U	Compound was analyzed for but not detected
J	Estimated value
--	No ST or GV
GV	Guidance Value
ST	Standard

Exceeds Class GA Standard/Guidance value

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Table 2-3
Town of Clarkstown Landfill
Annual Groundwater Monitoring Program
Monitoring Well Sample Results
Leachate Indicators

Units in mg/l Chemical Name	Sample ID Sample_date NYSDEC CLASS GA GROUNDWATER ST/GV	RFW-1S 10/05/22	MFW-1D 09/29/22	RFW-2 10/05/22	RFW-3S 09/30/22	RFW-3D 09/30/22	RFW-4D 10/03/22	RFW-5SR 09/30/22	RFW-6D 10/03/22	MFW-7S 10/05/22	MFW-8S 10/05/22	MFW-11 10/05/22
Alkalinity, Total (as CaCO3)	---	28.2	122	27.8	86.9	54.4	146	203	125	760	772	756
Biochemical Oxygen Demand (BOD)	---	66.1	2 U	66	2 U	2 U	2 U	2 U	2 U	6.5	5.5	4 U
Bromide	2 GV	--	--	--	--	--	--	--	--	--	--	--
Chloride (as Cl)	250 ST	62.1	103	62.3	20.3	2.4	77.3	80.5	22.8	8.4	5.5	5.9
Cod - Chemical Oxygen Demand	---	443	9.9 J	20.8	14.3	5.5 J	7.7 J	14.3	10 U	159	155	155
Color	15 ST	48	5 U	48	3 J	3 J	3 J	3 J	3 J	300	600	300
Hardness (as CaCO3)	---	157	276	37	130	80.3	260	326	135	410	404	394
Nitrogen, Ammonia (as N)	2 ST	0.086 J	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.86	96.6	94.3	95.6
Nitrogen, Kjeldahl, Total	---	3.7	0.1 U	0.65	0.1 U	0.1 U	0.097 J	0.1 U	0.84	115	117	118
Nitrogen, Nitrate (as N)	10 ST	0.12	1.6	0.05 U	2.1	2.3	1.5	1.3	0.05 U	0.05 U	0.05 U	0.05 U
Phenolics, Total Recoverable	0.001 ST	--	--	--	--	--	--	--	--	--	--	--
Sulfate (as SO4)	250 ST	--	--	--	--	--	--	--	--	--	--	--
Total Dissolved Solids	500 ST	462	430	181	231	151	390	492	174	504	510	576
Total Organic Carbon	---	134	1 U	9.8	1 U	1 U	1 U	0.74 J	1 U	47	49.7	47.9

mg/l	Milligrams per liter
U	Compound was analyzed for but not detected
J	Estimated detection limit or value
--	No ST or GV or not analyzed
GV	Guidance Value
ST	Standard

Exceeds Class GA Standard

Table 3-1
Town of Clarkstown Landfill
Surface water and Leachate Sample Results
Volatile Organic Compounds

Units in ug/l	Sample ID Sample_date	SW-1 10/05/22	SW-2 10/05/22	SW-3 10/05/22	SW-4 10/05/22	SW-5 10/05/22	SW-6 10/05/22	SW-7 10/05/22	LEACHATE 10/05/22
COMPOUNDS	NYSDEC CLASS GA GROUNDWATER ST/GV								
1,1,1,2-Tetrachloroethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	1 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichloropropane	0.04 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromo-3-Chloropropane	0.04 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane	0.0006 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	3 ST++	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	0.6 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	1 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	3 ST++	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2-Butanone (MEK)	50 GV	5 U	1.8 J	1.7 J	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-Pentanone	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	50 GV	3 J	9.6	10.9	7.1	6.9	7.9	6	4.7 J
Acrylonitrile	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzene	1 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromochloromethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	50 GV	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromoform	50 GV	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromomethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Carbon Disulfide	60 GV	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Carbon Tetrachloride	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.8
Chloroethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	7 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloromethane	5 ST	1.3	1 U	1.1	1 U	1 U	1 U	1 U	1 U
Cis-1,2-Dichloroethylene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cis-1,3-Dichloropropene	0.4 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	50 GV	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dibromomethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Iodomethane (Methyl Iodide)	5 ST	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Methylene Chloride	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Styrene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethylene(PCE)	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Total Xylenes	5 ST	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Trans-1,2-Dichloroethene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trans-1,3-Dichloropropene	0.4 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trans-1,4-Dichloro-2-Butene	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethylene (TCE)	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichlorofluoromethane	5 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl Acetate	--	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl Chloride	2 ST	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Total Volatile Organic Compounds	--	4.3	11.4	13.7	7.1	6.9	7.9	6	6.5

ug/l Micrograms per liter
++ Applies to sum of isomer
GV Guidance Value
ST Standard

U Compound was analyzed for but not detected
J Estimated value
-- No ST or GV or analyzed
Exceeds Class GA Standard/Guidance value

D&B ENGINEERS AND ARCHITECTS

Table 3-2
Town of Clarkstown Landfill
Surfacewater and Leachate Sample Results
Inorganic Parameters

Units in ug/l Sample ID Sample_date		SW-1 10/05/22	SW-2 10/05/22	SW-3 10/05/22	SW-4 10/05/22	SW-5 10/05/22	SW-6 10/05/22	SW-7 10/05/22	LEACHATE 10/05/22
METALS	NYSDEC CLASS GA GROUNDWATER ST/GV								
Aluminum	--	490	4020	1770	590	443	303	2020	70.9 J
Antimony	3 ST	60 U	60 U	60 U	60 U	60 U	60 U	60 U	60 U
Arsenic	25 ST	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Barium	1000 ST	33.2 J	64.1 J	46.3 J	21.5 J	22.7 J	21.2 J	45.1 J	281
Beryllium	3 GV	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Boron	1000 ST	77.1	90.6	112	7.1 J	15.8 J	20.3 J	105	943
Cadmium	5 ST	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Calcium	--	20200	45400	40100	3640	5960	6430	36600	123000
Chromium, Hexavalent	50 ST	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Chromium, Total	50 ST	10 U	8.7 J	4.7 J	2.4 J	3.3 J	4.6 J	5.1 J	3.8 J
Cobalt	--	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Copper	200 ST	13.4 J	32.7	22.3 J	4.7 J	9.2 J	8.8 J	21.3 J	7.3 J
Cyanide	200 ST	10 U	54.1	15.2	10 U	10 U	10 U	15.1	10 U
Iron	300 ST	644	5240	2310	1110	780	592	2670	10400
Lead	25 ST	3.1 J	25.3	14.9	13.1	8.8	7.5	14.1	5 U
Magnesium	35000 GV	4350	6920	7010	619	623	622	6620	31500
Manganese	300 ST	94.3	316	184	23.1	15.6	12.6	186	900
Mercury	0.7 ST	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	100 ST	10.1 J	23.9 J	15.6 J	40 U	40 U	40 U	16.6 J	33.8 J
Potassium	--	1940 J	30700	29600	5000 U	5000 U	5000 U	28500	20100
Selenium	10 ST	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Silver	50 ST	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Sodium	20000 ST	23400	28800	36300	5000 U	5000 U	5000 U	34900	192000
Thallium	0.5 GV	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vanadium	--	3.6 J	12.5 J	6.7 J	50 U	50 U	50 U	7.3 J	3.8 J
Zinc	2000 GV	36.8	75.8	42.8	40.1	38.5	32.9	44.5	20 U

ug/l	Micrograms per liter
U	Compound was analyzed for but not detected
J	Estimated value
--	No ST or GV
GV	Guidance Value
ST	Standard
Exceeds Class GA Standard/Guidance value	

D&B ENGINEERS AND ARCHITECTS

Table 3-3
Town of Clarkstown Landfill
Surfacewater and Leachate Sample Results
Leachate Indicators

Units in mg/l Chemical Name	Sample ID Sample_date	SW-1 10/05/22	SW-2 10/05/22	SW-3 10/05/22	SW-4 10/05/22	SW-5 10/05/22	SW-6 10/05/22	SW-7 10/05/22	LEACHATE 10/05/22
	NYSDEC CLASS GA GROUNDWATER ST/GV								
Alkalinity, Total (as CaCO3)	--	38.7	109	102	13.3	15.3	15.7	98.4	566
Biochemical Oxygen Demand (BOD)	--	24.5	13.1	13.9	2 U	2 U	2 U	18.5	7.5
Bromide	2 GV	--	--	--	--	--	--	--	--
Chloride (as Cl)	250 ST	46.8	51.1	53.2	1.0 J	1.9 J	1.8 J	33.5	256
Cod - Chemical Oxygen Demand	--	23	221	221	25.2	31.8	25.2	296	58.2
Color	15 ST	40 J	400	400	17	26	26	600	130
Hardness (as CaCO3)	--	68.4	142	129	11.6	17.4	18.6	119	437
Nitrogen, Ammonia (as N)	2 ST	0.063 J	0.74	0.61	0.1 U	0.057 J	0.059 J	0.69	17.8
Nitrogen, Kjeldahl, Total	--	0.75	7.1	4.9	0.66	0.37	0.26	6.9	18.9
Nitrogen, Nitrate (as N)	10 ST	0.66	1.5	1.5	0.05 U	0.063	0.076	0.74	0.05 U
Phenolics, Total Recoverable	0.001 ST	--	--	--	--	--	--	--	--
Sulfate (as SO4)	250 ST	--	--	--	--	--	--	--	--
Total Dissolved Solids	500 ST	110	322	316	70	40	32	320	932
Total Organic Carbon	--	7.1	59.4	64.2	4	3.8	5	63.6	16.3

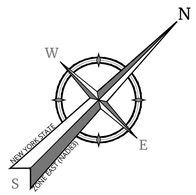
mg/l	Milligrams per liter
U	Compound was analyzed for but not detected
J	Estimated value
--	No ST or GV or not analyzed
GV	Guidance Value
ST	Standard

Exceeds Class GA Standard

D&B ENGINEERS AND ARCHITECTS

APPENDIX A

SETTLEMENT PLATE AND RAILROAD SPIKE ELEVATION MEASUREMENTS



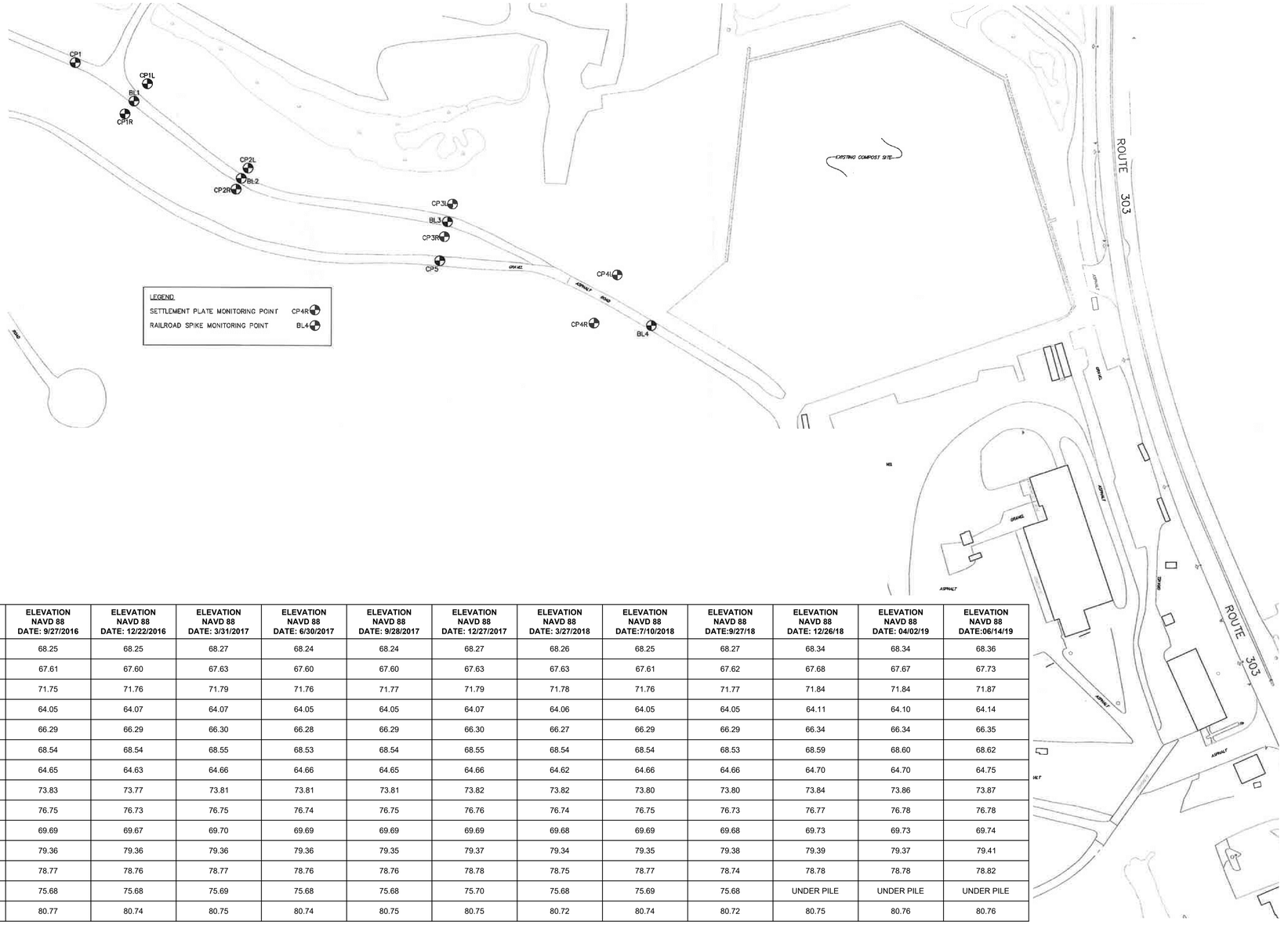


PLATE ID	DESCRIPTION	NORTHING NAD83 N.Y.S. PLANE	EASTING NAD 83 N.Y.S. PLANE	ELEVATION NAVD 88 DATE: 6/28/2016	ELEVATION NAVD 88 DATE: 9/27/2016	ELEVATION NAVD 88 DATE: 12/22/2016	ELEVATION NAVD 88 DATE: 3/31/2017	ELEVATION NAVD 88 DATE: 6/30/2017	ELEVATION NAVD 88 DATE: 9/28/2017	ELEVATION NAVD 88 DATE: 12/27/2017	ELEVATION NAVD 88 DATE: 3/27/2018	ELEVATION NAVD 88 DATE:7/10/2018	ELEVATION NAVD 88 DATE:9/27/18	ELEVATION NAVD 88 DATE: 12/26/18	ELEVATION NAVD 88 DATE: 04/02/19	ELEVATION NAVD 88 DATE:06/14/19
CP1	SETTLEMENT PLATE	822987.740	641890.083	68.23	68.25	68.25	68.27	68.24	68.24	68.27	68.26	68.25	68.27	68.34	68.34	68.36
BL1	SETTLEMENT PLATE	822924.730	641986.272	67.59	67.61	67.60	67.63	67.60	67.60	67.63	67.63	67.61	67.62	67.68	67.67	67.73
CP1R	SETTLEMENT PLATE	822903.818	641971.437	71.74	71.75	71.76	71.79	71.76	71.77	71.79	71.78	71.76	71.77	71.84	71.84	71.87
CP1L	SETTLEMENT PLATE	822953.628	642008.432	64.06	64.05	64.07	64.07	64.05	64.05	64.07	64.06	64.05	64.05	64.11	64.10	64.14
BL2	SETTLEMENT PLATE	822798.238	642162.130	66.29	66.29	66.29	66.30	66.28	66.29	66.30	66.27	66.29	66.29	66.34	66.34	66.35
CP2R	SETTLEMENT PLATE	822780.231	642153.812	68.50	68.54	68.54	68.55	68.53	68.54	68.55	68.54	68.54	68.53	68.59	68.60	68.62
CP2L	SETTLEMENT PLATE	822815.219	642173.389	64.66	64.65	64.63	64.66	64.66	64.65	64.66	64.62	64.66	64.66	64.70	64.70	64.75
BL3	SETTLEMENT PLATE	822728.485	642499.898	73.83	73.83	73.77	73.81	73.81	73.81	73.82	73.82	73.80	73.80	73.84	73.86	73.87
CP3R	SETTLEMENT PLATE	822703.752	642495.122	76.76	76.75	76.73	76.75	76.74	76.75	76.76	76.74	76.75	76.73	76.77	76.78	76.78
CP3L	SETTLEMENT PLATE	822757.886	642508.162	69.69	69.69	69.67	69.70	69.69	69.69	69.69	69.68	69.69	69.68	69.73	69.73	69.74
BL4	RAILROAD SPIKE	822558.793	642836.194	79.38	79.36	79.36	79.36	79.36	79.35	79.37	79.34	79.35	79.38	79.39	79.37	79.41
CP4R	SETTLEMENT PLATE	822562.268	642742.109	78.78	78.77	78.76	78.77	78.76	78.76	78.78	78.75	78.77	78.74	78.78	78.78	78.82
CP4L	SETTLEMENT PLATE	822642.269	642779.743	75.69	75.68	75.68	75.69	75.68	75.68	75.70	75.68	75.69	75.68	UNDER PILE	UNDER PILE	UNDER PILE
CP5	SETTLEMENT PLATE	822663.800	642487.720	80.77	80.77	80.74	80.75	80.74	80.75	80.75	80.72	80.74	80.72	80.75	80.76	80.76

PLATE ID	ELEVATION NAVD 88 DATE:10/08/19	ELEVATION NAVD 88 DATE:01/02/2020	ELEVATION NAVD 88 DATE:04/09/2020	ELEVATION NAVD 88 DATE:07/09/2020	ELEVATION NAVD 88 DATE:10/29/2020	ELEVATION NAVD 88 DATE:1/27/2021	ELEVATION NAVD 88 DATE:3/26/2021	ELEVATION NAVD 88 DATE:7/27/2021	ELEVATION NAVD 88 DATE:9/30/2021	ELEVATION NAVD 88 DATE:4/07/22	ELEVATION NAVD 88 DATE:6/23/22	ELEVATION NAVD 88 DATE:10/05/22							AS-BUILT ELEVATIONS (PROVIDED BY OTHERS) RECORDED 7/10/2000
CP1	68.36	68.44	68.37	68.36	68.39	68.39	68.37	68.38	68.36	68.39	68.37	68.38							70.57
BL1	67.72	67.76	67.70	67.80	67.72	67.72	67.71	67.77	67.70	67.71	67.71	67.70							70.30
CP1R	71.88	71.93	71.86	71.94	71.88	71.89	71.87	71.89	71.87	71.89	71.86	71.87							74.29
CP1L	64.14	64.18	64.11	64.21	64.12	64.13	64.11	64.12	64.10	64.11	64.12	64.10							67.22
BL2	66.37	66.39	66.34	66.41	66.36	66.36	66.34	66.38	66.33	66.34	66.33	66.33							69.54
CP2R	68.62	68.65	68.60	68.67	68.63	68.62	68.62	68.59	68.58	68.58	68.61	68.58							71.72
CP2L	64.72	64.76	64.71	64.76	64.73	64.73	64.72	64.69	64.70	64.70	64.69	64.67							67.85
BL3	73.86	73.87	73.85	73.89	73.89	73.85	73.89	73.85	73.82	73.83	73.85	73.91							76.52
CP3R	76.80	76.81	76.78	76.82	76.82	76.80	76.80	76.81	76.76	76.75	76.76	76.76							79.34
CP3L	69.76	69.77	69.74	69.76	69.77	69.73	69.80	69.75	69.72	69.71	69.70	69.71							72.43
BL4	79.37	79.33	79.36	79.45	79.36	79.36	79.35	79.34	79.30	79.31	79.29	79.30							82.64
CP4R	78.80	78.76	78.78	78.86	78.79	78.78	78.78	78.78	78.74	78.73	78.74	78.72							82.11
CP4L	UNDER PILE	UNDER PILE	UNDER PILE	UNDER PILE	UNDER PILE	75.41	75.42	N/A	75.39	75.39	75.44	N/A							78.38
CP5	80.78	80.79	80.76	80.80	80.81	80.77	80.78	80.78	80.78	80.75	80.74	80.74							83.80

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Donald Philip Schel
NEW YORK LICENSED LAND SURVEYOR
LICENSE NUMBER: 050820
COLLIERS ENGINEERING & DESIGN CT, P.C.
N.Y. C.O.A. #: 0017608

MONITORING SURVEY

TOWN OF CLARKSTOWN LANDFILL PROJECT

TOWN OF CLARKSTOWN
ROCKLAND COUNTY
STATE OF NEW YORK

Colliers Engineering & Design
ALBANY
18 Computer Drive East, Suite 203
Albany, NY 12205
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COLLIERS ENGINEERING & DESIGN CT, P.C. DOING BUSINESS AS MASER CONSULTING ENGINEERING & LAND SURVEYING

SCALE:	DATE:	DRAWN BY:	CHECKED BY:
N.T.S.	10/07/2022	NJL	DPS

PROJECT NUMBER:	DRAWING NAME:
16000516A	V-SURV_CLARKSTOWN_LANDFILL

SHEET TITLE:

SHEET NUMBER: 1 of 1

16A\dwg\V-SURV_clarkstown_landfill.dwg[SETTLEMENT PLATE LOCATIONS TABLE By:JLCLARK

APPENDIX B

PACE GROUNDWATER ANALYTICAL DATA PACKAGE

APPENDIX C

PACE SURFACE WATER AND LEACHATE ANALYTICAL DATA PACKAGE